**University of Arizona**

**Osmium Tetroxide Standard Operating Procedure**

*[This is a template. Fill in all necessary blanks and delete all highlighted areas when complete. Add any sections necessary for your laboratory. This will be appended to your Laboratory Chemical Hygiene Plan.]*

**Title:**  **Click here to enter the title of your SOP.**

**Approval Holder (AH):** Click here to enter text **Approval #:** Click here to enter text

**Approval Holder Phone Number(s):** Click here to enter text

**Approval Safety Coordinator (ASC):** Click here to enter text

**Approval Safety Coordinator Phone Number(s):** Click here to enter text

**Department:** Click here to enter text

1. **Purpose**

This standard operating procedure (SOP) is intended to provide guidance on how to safely use, store, and dispose of osmium tetroxide in Enter AH’s name’s laboratory. Laboratory personnel should review this SOP, as well as the appropriate Safety Data Sheet(s) (SDSs), before Describe the procedure or process this SOP will address. If you have questions concerning the requirements within this SOP, contact your Approval Holder (AH) or Approval Safety Coordinator (ASC).

1. **Scope**

*[Describe when this SOP applies and to whom this SOP applies.]*

1. **Hazard Description**

*[Describe the hazards presented by the procedure or process this SOP addresses. What makes it hazardous? Provide an example, if applicable.]*



Osmium tetroxide (OsO4) is an acutely toxic, corrosive solid that is used as an organic synthesis reagent, a stain for electron microscopy, and a fixative for biological samples. Osmium tetroxide can penetrate plastics and sublimes at room temperature and atmospheric pressure. It can be fatal if ingested, inhaled, or absorbed through the skin. Osmium tetroxide causes severe skin burns and eye damage, including staining the cornea of the eye and cause blindness.

1. **Process & Hazard Controls**

*[Describe the steps needed to set up and complete the procedure or process in safe manner following the* [*hierarchy of controls*](https://www.cdc.gov/niosh/topics/hierarchy/default.html)*. Use as much detail as is necessary to ensure all laboratory workers can complete the procedure or experiment safely.]*

* 1. **Elimination/Substitution**

*[Describe any eliminations of hazardous chemicals or processes; alternatively, any substitutions with less hazardous alternatives that could be used to accomplish the task. Delete this section if you are unable to eliminate or substitute.]*

* 1. **Engineering Controls**

*[Describe any engineering controls (e.g. fume hoods, gas cabinets, local exhausts, blast shields, etc.) that are used to safely accomplish the task.]*

* **Fume hood**
  + Only use a fume hood or other enclosed local exhaust to keep exposure to osmium tetroxide vapors as low as possible. Contact RLSS for assist with choosing an appropriate ventilated enclosure.
  1. **Work Practices**

*[Describe any work practices (e.g. staggering schedules, additional cleaning measures for particulates, etc.) that are used to safely accomplish the task.]*

* Do not work alone when working with osmium tetroxide.
* If weighing osmium tetroxide powder and the balance cannot be located in a chemical fume hood, tare a container then add the powdered osmium tetroxide to the container in a chemical fume hood (NOT a Biological Safety Cabinet) and seal the container before returning to the balance to weigh the powder.
* Set up a designated area for work with osmium tetroxide. If appropriate for long-term experimental usage, post signage for osmium tetroxide and display it in conspicuous locations during the experiments.
* Line work surfaces with plastic-backed absorbent pads to ensure containment of any spills.
* Keep containers closed as much as possible.
* When osmium tetroxide is freshly prepared and active, it is colorless to pale yellow in color. When the material reacts and causes oxidation, it turns black. This is helpful to know especially in the event of a splash or spill or inadvertent dermal exposure (black dots on skin).
* Change gloves regularly (at least every two hours) and wash hands at the time of the glove change.
* Wash hands thoroughly immediately after working with any concentration of osmium tetroxide.
  1. **Personal Protective Equipment**

*[Describe the personal protective equipment needed to adequately protect laboratory workers when performing the process or procedure addressed by this SOP. Ensure to specify any personal protective equipment beyond the minimum (i.e. safety glasses, lab coat, gloves, long pants and closed-toed shoes).]*

* **Hand and Arm Protection**: Elbow-length, acid resistant gloves should always be used when creating, working with, or cleaning up aqua regia solutions.
* **Face and Eye Protection**: Safety goggles are a minimum protection; the use of a face shield with eye protection is strongly recommended to protect both the eyes and face from splashes.
* **Body Protection**: A 100% cotton lab coat should be used and can be combined with an acid resistant apron to prevent exposure to the body.
* **Respiratory Protection**: Respirators may be required if exposures are not able to be adequately controlled by the use of engineering controls or other means. All uses of respiratory protection require RLSS assessment and consultation (for assessment of work, selection of respirator and filtration, and OSHA-mandated medical clearance and fit testing). Contact [rlss-ppe@arizona.edu](mailto:rlss-ppe@arizona.edu) with any questions or concerns.
  1. **Transportation and Storage**

*[Describe how to safely transport and/or store (e.g. ventilated cabinet, flammable cabinet, under inert blanket, etc.) the hazardous chemical(s) or processes.]*

* Store in glass at sub-ambient temperatures and keep containers tightly closed to limit sublimation. Do not use plastic containers.
* Keep in a dry, well-ventilated place.
* Incompatibilities include strong reducing agents, organic materials, powdered metals, and hydrochloric acid – contact will cause formation of poisonous chlorine gas.

1. **Spills, Cleanup & Disposal**

*[Describe how to safely end the procedure or process, clean up the process or spills, and/or dispose of any waste generated.]*

Spill response should always follow the [University Chemical Hygiene Plan](https://rgw.arizona.edu/sites/default/files/cs-univeristy_chemical_hygiene_plan.pdf) Section 8.2.

**Exposure Response**

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| --- | --- | --- | --- |
| **Inhalation** | **Ingestion** | **Skin Contact** | **Eye Contact** |
| Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a  pocket mask equipped with a one-way valve or other proper respiratory medical device.  Immediate medical attention is required. | Do NOT induce vomiting. Call a physician or poison control center immediately | Wash off immediately with plenty of water for at least 15 minutes. Immediate medical  attention is required. | Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In  the case of contact with eyes, rinse immediately with plenty of water and seek medical  advice. |

1. **Enter Additional Section Title**

*[Add as many sections as necessary to adequately describe how to safely perform the procedure or process addressed by this SOP.]*

1. **References**

* UCLA Osmium tetroxide SOP: <https://ucla.box.com/s/xf0hunokkosmo1yxiisihrrkhc5ojfbw>
* Boston University: <https://www.bu.edu/researchsupport/compliance/laboratory-safety/high-hazard-chemical-program-2/osmium-tetroxide-sop-template/>